CHAPTER 15

HANDLING, SHIPMENT, AND LIMITED STORAGE

Section I. GENERAL

15-1. General Precautions

a. The NIKE HERCULES guided missile, in common with other types of ammunition, is designed to be as safe in handling as is consistent with its function and is packed to withstand all conditions ordinarily encountered in storage and transit except extremes in temperature. In order to insure that the guided missile will be in a serviceable condition when required for use and to provide the highest possible protection to personnel and materiel, the precautions outlined in this paragraph, in addition to those general instructions for the storage, care, handling, and preservation of ammunition prescribed in TM 9-1300-206 and FM 9-5 will be observed.

b. Disassembly of the NIKE HERCULES guided missile or its components beyond the limits authorized for the operator or organizational personnel must never be attempted.

c. Packages should not be opened until required for use or inspection.

d. Explosive components should at all times be protected from induced electric currents, such as those encountered in the vicinity of radio communication equipment, high-tension wires, radar units, etc.

e. In making electrical connections during assembly, testing, or prefiring operations, care must be exercised to see that connections are good and that insulated sections are properly protected.

f. Shorting clips and plugs on electrical circuits and/or explosive components shall be removed only when necessary for assembly, testing, or firing.

15-2. Handling

a. General. The missile must be handled only with issued or approved equipment. In handling, care must be taken not to damage the missile or its components. The propellant grain and the metal parts of the missile are susceptible to damage by rough handling, dropping, etc. Such mishandling could cause a misfire at launch. The propellant grain is particularly subject to damage at low temperatures. Dents in body or fins can cause erratic flight, while dents in the rocket motor can cause dangerous pressure build-ups. Motors which have damaged propellant grain or metal parts must not be used. Crated or uncrated motors which have been dropped shall not be used until motor and propellant grains have been inspected and their serviceability determined.

b. Packaged Items. Those packaged items, which, because of their weight or size, present handling problems, must be lifted with a wrecker, forklift, or crane of adequate capacity.

c. Unpackaged Items. The missile components must be handled only with approved handling fixtures, using a hoist, wrecker, or crane of adequate capacity.

15-3. Safety

a. The explosive components removed from a missile or missile component, or a missile from which components have been removed for repair, will be stored as follows:

(1) CONUS and RISING STAR-type installations—those in any one launching section will be stored in the underground casements.

(2) USARAL and USAREUR-type installations—within the storage buildings and the doors closed.
(3) Mobile installations—moved to a location not less than 30 feet from the launcher.

b. No repair operation involving the use of power tools, welding, soldering, cutting, etc., will be permitted on any item, component, or assembly containing explosives.

15–4. Class V and General Supply Items

a. Class V Items. These items are as listed in table 15–1. Information necessary for determination of quantity-distance requirements and storage compatibility is included in this table. These items will be requisitioned or returned through class V ammunition supply channels. Handling and storage of these items will be in accordance with the safety precautions and general instructions contained in TM 9–1300–206 and FM 9–5.

b. General Supply Items. All components of the guided missile not listed in table 15–1 are general supply items when handled or requisitioned as separate components or assemblies. These items will be requisitioned or returned through general supply channels.

Table 15–1. Explosive Weight, Quantity-Distance Classes, and Storage Compatibility Group for Class V Items

Component	Explosive weight (lb)	Quantity-distance class	Storage compatibility group
ETHYLENE OXIDE	N/A	150	P1
EXPLOSIVE HARNESS ASSY	0.25	7	B, E, N
INITIATOR	1440 mg	3	B, E, N
IGNITER, ROCKET MOTOR	2.2	7	0
ROCKET MOTOR M5E1	755	2	F
ROCKET MOTOR M30 SERIES	2396	2	F
ROCKET MOTOR CLUSTER M42	3020	2	F
SAFETY-AND-ARMING DEVICE M30A1	5 grains	3	B
WARHEAD ASSEMBLY M135	651	7	G

Section II. SHIPMENT

15–5. Shipping Instructions

a. General. When shipping guided missiles or any of their packaged components, the officer in charge of the preparation will be responsible for furnishing the items and their packages in a properly cleaned, preserved, painted, and marked condition for safe rail, truck, or air shipment. Such preparation will be in conformance with instructions in this section and in accordance with the elements outlined below.

Note. The shipment of classified items must be in accordance with AR 380–55 and AR 55–355.

(1) *Inspection.* Determine by inspection the necessary steps for preparation of items prior to shipment.
(2) *Decontamination or Purging.* If decontamination or purging is required after defueling and depressurization, perform same in accordance with the procedures in paragraph 11–31.
(3) *Preservation.* Application of any required desiccants, cleaning materials, and preservatives should be performed in accordance with procedures in chapter 11.
(4) *Containers.* Unpackaged items should be repackaged in their original containers, or equivalent, prior to shipment.
(5) *Air Pressurization.* Packages requiring pressurization should be pressurized in accordance with instructions marked on the containers.
(6) *Shipping Crates.* Containers should be assembled to their appropriate crates and skids.

(7) *Recording Data.* The necessary entries should be recorded in the log book and on the shipping documents.

b. Shipping Documents. Prepare shipping documents accompanying shipments in accordance with AR 725-5.

c. Regulations. Regulations pertaining to the transportation and shipment of missiles and missile components are given in paragraph 15-7.

15-6. Loading Guided Missiles and Components on Railroad Cars and Trucks

a. Preparation. All items requiring loading by means of cranes, A-frames, hoists, lift trucks, or other means should be properly prepared for safety and ease of handling.

b. Markings, Labels, and Placards. The markings, labels, and placards required for rail and truck shipment of explosive and flammable missile components are given in table 15-2. All rolling stock used for transporting missiles and rocket motors must be placarded with DO NOT HUMP signs to prevent damage when loading due to excessive impacts during coupling and shunting operations at the railroad yards. For additional information on markings and labels refer to *h.*(2)*(g)* below.

c. Methods of Loading. Exercise care at all times when loading freight cars or trucks. Loading this type of materiel should be planned carefully. When packages are being loaded on vehicles, the packages should be handled by their lifting rings or lifting handles. Appropriate lift points should be used in order to eliminate hazards and prevent damage to the materiel. General handling precautions are given in paragraphs 15-1 and 15-2. Package data is given in table 15-4 as an aid in planning the shipment of missile components by freight car or motor truck.

d. Types of Freight Cars. Missile components may be loaded on flatcars equipped with stake pockets, gondola cars (flat-bottom, open-top) having fixed or drop ends, or boxcars. The packages are loaded in the cars and are blocked and stayed in position as indicated in *g* below.

e. Types of Motor Trucks. Inspected and approved motor trucks, open or closed, may be used for the shipment of missiles or missile components. Regulations and precautions pertaining to motor truck shipment are given in *h* below. Additional shipping regulations are given in paragraph 15-7.

f. Compatibility.

(1) *General.* For greater safety during shipment, missile components are grouped for compatibility. These groups are based upon such factors as sensitivity to initiation by fire or by explosion and quantity of explosive (if any) contained in the unit.

(2) *Loading compatibility.* Loading compatibility for explosive missile components for shipment by rail or motor vehicle is given in table 15-3.

Note. Inert components are not included since they may be loaded with other inert or explosive components without compatibility considerations.

Table 15-2. Marking, Labels, and Placards for Rail and Truck Shipment of Explosive and Flammable Missile Components

Component	Marking	Placard
ETHYLENE OXIDE	Flammable liquid	Dangerous*
EXPLOSIVE HARNESS ASSEMBLY	Boosters (Explosive), Handle Carefully	Explosive
IGNITER, ROCKET MOTOR	Igniter, Rocket Motor, Class A Explosive	Explosive
ROCKET MOTOR M5E1 OR CLUSTER M42	Rocket Motor, Class B Explosive	Dangerous
ROCKET MOTOR M30	Rocket Motor, Class B Explosive	Dangerous
SAFETY-AND-ARMING DEVICE M30A1	Percussion Fuzes, Handle Carefully	None
WARHEAD ASSEMBLY M135	Explosive Projectile	Explosive

*Trucks loaded with less than 2,500 pounds gross weight do not require placards.

Table 15-3. Loading Compatibility for Hazardous Missile Components for Rail and Motor Truck Shipment

Components	Ethylene oxide	Explosive harness assembly	Igniter, rocket motor	Rocket motor M5E1 or cluster XM42	Rocket motor XM30	Safety-and-arming device M30A1	Warhead assembly M135
ETHYLENE OXIDE[1]	YES	NO	NO	NO	NO	YES	NO
EXPLOSIVE HARNESS ASSEMBLY	NO	YES	YES	YES	YES	YES	YES
IGNITER, ROCKET MOTOR[2]	NO	YES	YES	YES	YES	YES	YES
ROCKET MOTOR M5E1 OR CLUSTER M42	NO	YES	YES	YES	YES	YES	YES
ROCKET MOTOR M30	NO	YES	YES	YES	YES	YES	YES
SAFETY-AND-ARMING DEVICE M30A1	YES	YES	YES	YES	YES	YES	YES
WARHEAD ASSEMBLY M135	NO	YES	YES	YES	YES	YES	YES

[1] For safety reasons, it is recommended that this item be shipped and stored separately.
[2] Igniters shipped in the same containers with rocket motors are considered the same as the rocket motor for compatibility.

g. Blocking and Staying of Freight Cars. The correct application of blocking and staying of ammunition is extremely important from the standpoint of safety and prevention of damage to the materiel. In many cases, the required amount of bracing may seem excessive for the packages involved. However, the carrying vehicle may be accidently subjected to impacts of greater magnitude than desirable. These impacts result in high momentary pressures and may displace or damage packages not sufficiently secured. The blocking and staying instructions and information given in Bureau of Explosives Pamphlets Nos. 6 and 6A are minimum. Additional instructions, if required, should be obtained in order to insure adequacy of blocking and staying for any particular shipment. For complete information on typical methods of blocking and staying and on regulations pertaining thereto, consult the list of applicable references included in paragraph 15-7.

h. Motor Truck Shipments; Regulations and Precautions.

(1) *Regulations.*

(a) Regulations governing the transportation of ammunition and explosives by commercial motor truck are governed by Department of Transportation regulations; regulations for government-owned vehicles are covered by Army regulations.

(b) Most states, cities, and towns have their own regulations concerning the transportation of explosives within their jurisdiction. Local authorities of sections through which motor truck shipments will pass should be consulted and their recommendations as to the least hazardous and least congested areas adhered to.

(c) Commercial highway carriers must file a certificate with the controlling transportation officer stating that said carriers will comply with all laws promulgated by Federal, State, and local governments applicable to the type of explosive or other dangerous article to be transported.

(d) When government-operated vehicles are used for transporting explosive or dangerous materiel, the shipping officer will take all necessary precautions to insure safe transit and will provide for full compliance with DOT regulations. If the commanding officer or other appropriate authority declares the shipment to be an emergency, the shipping officer will take every reasonable precaution to insure safe movement of the explosives or other dangerous articles while in transit.

(*e*) When trucks have been loaded and are ready for movement, the drivers will be informed by means of written instructions of the true nature of materiel on the trucks, the fire hazards involved, the methods to be used in fighting fires involving the cargo or truck, the missile distance in case of explosion, the proper distance to maintain between trucks, and any other information that will aid in bringing about safe delivery of the shipment.

(2) *Precautions.*

(*a*) Every precaution against fire must be observed. Trucks should be inspected before loading to ascertain that electric wiring, light, brakes, fuel tanks, and lines are in good working order, the engine free of oil and dust, and the engine pan free of accumulations of grease and dirt. Accumulations of grease or oil on universal joints, transmissions, and the underside of bodies should be removed. When necessary to use matches, only safety matches may be used. The use of strike-anywhere matches is prohibited.

(*b*) All trucks must be provided with two filled fire extinguishers inspected and labeled in conformity with EXPLOSIVE (class A) and DANGEROUS (class B) requirements of the Underwriters Laboratories or equal thereof. Preferred types of extinguisher are vaporizing-liquid types (minimum 1-quart capacity each). All drivers and other persons handling ammunition and explosives should be instructed as to the best methods in using the fire extinguishers and procedures for extinguishing fires in gasoline, fuel oil, or truck tires.

(*c*) When possible, explosives and ammunition will be transported during daylight hours.

(*d*) For any continuous trips longer than 8 hours, military vehicles carrying class A or B materiel require an assistant driver.

(*e*) Smoking is not permitted in the cabs of vehicles transporting class A or B materiel.

(*f*) Vehicles will not be left unattended on a public street or highway. Parking on public streets and urban or suburban areas is prohibited.

(*g*) Motor vehicles carrying explosives or ammunition will bear four of the required reflectorized placards indicating either EXPLOSIVES or DANGEROUS, whichever is appropriate.

(*h*) In case of accident, all packages should be removed carefully and placed in a location of safety. If vehicle is entangled with another vehicle or object, the load should first be removed to a place of safety prior to disentanglement.

15–7. Regulations for Transportation and Shipment of Missiles and Missile Components

a. General. The regulations governing transportation and shipment of missiles and their components by common carrier are given in *b* below. These regulations are equally applicable to military establishments concerned with these activities.

b. Regulations.

(1) *Interstate Commerce Commission; Motor Carrier Safety Regulations.* These regulations provide rules and regulations for the operation of commercial vehicles and other information applicable to carriers.

(2) *Code of Federal Regulations, Title 49—Transportation (Parts 71 to 90)* These regulations cover transportation of explosives and other dangerous articles by rail. Rules are also prescribed for blocking, loading, and staying of shipments, as well as quantities of items allowed for railway express shipments. These regulations are published by the U.S. Government Printing Office.

Table 15–4. Package Data

Component	Container	Dimensions (L W H)	Cubic feet	Weight (lb)
BATTERY STORAGE, BB 401/U	4/wdn bx	17–3/8 x 11–3/16 x 11–3/32	1.34	75
BODY, Rear Section	1/mtl cntr	222–1/2 x 54–1/2 x 61–3/4	433.33	4,618
CLUSTER, ROCKET MOTOR, M42	1/wdn cr	180–3/4 x 45–3/4 x 51–5/8	214.60	7,267
ETHYLENE OXIDE	25 gal/comm cyl	15–1/2 dia x 49–1/2	6.82	280
EXPLOSIVE HARNESS Assembly	1/ctn, 10 ctn/ wdn bx	29–1/16 x 21–1/4 x 13–5/16	4.76	37.34
FIN, MAIN, FORWARD AND REAR	4 fwd & 4 rear/ wdn cr	146–7/8 x 29 x 41–1/8	101.37	960
FIN, ROCKET MOTOR CLUSTER	4/wdn cr	51–1/16 x 29–5/16 x 51–1/2	45.12	600
ROCKET MOTOR M5E1	1/wdn cr	173–1/2 x 25 x 28–1/2	71.44	1,970
ROCKET MOTOR M30	1/wdn cr	105–1/8 x 43–1/4 x 47–7/16	124.81	2,678.52
SAFETY-AND-ARMING DEVICE M30A1	1/mtl cntr, 20	15–1/2 x 9–1/4 x 8	0.66	25
THRUST STRUCTURE W/CLUSTER COMPONENTS	1 set/wdn bx	38–1/2 x 38–1/2 x 46	38.6	309
WARHEAD ASSEMBLY M135	1/mtl cntr	162 x 54–1/4 x 61–9/16	313.1	3,625

(3) *Bureau of Explosives Pamphlets No. 6 and 6A.* These publications illustrate proper methods of loading and bracing of freight car shipments of explosives, dangerous articles, loaded bombs, and similar items. The publications are issued by the Bureau of Explosives, 30 Vesey St., New York, New York 10007.

(4) *Tariff No. 10 Publishing Interstate Commerce Commission Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water, in Rail Freight Service and by Motor Vehicle (Highway) and Water: Including Specifications for Shipping Containers.* This publication is issued by H.A. Campbell, Agent, 30 Vesey St. New York, New York 1007.

(5) *Civil Aeronautics Authority Regulations: Official Air Transpost Restricted Articles Tariff No. 6-A.* These regulations are published by the U. S. Civil Aeronautics Board.

(6) *Department of the Army Technical Bulletin 59-1.* This publication covers the transportation, packaging, and handling of dangerous materials for military aircraft, including the Military Air Transport Service.

Section III. LIMITED STORAGE

15-8. General

Proper storage of guided missiles and components is necessary in order to insure safety and serviceability of the items for use. Only undamaged packages will be stored at storage sites. Damaged packages will be placed in a segregated location pending determination of the hazards involved and damage to the item. The elements outlined in *a* through *b* below and in subsequent paragraphs should be observed.

a. Sheltered storage is preferred whenever possible, although pressurized containers require no special storage facilities.

b. Open storage sites should be on firm, well-drained land. Suitable trenches should be dug to prevent water from running under piles.

c. When it is necessary to leave ammunition in the open, raise it on dunnage at least 6 inches above the ground, and cover it with a double thickness of flameproofed paulin, leaving enough space for the circulation of air.

d. Protect storage site from high heat such as full impact of solar radiation or flame.

e. The storage site should be free of dry grass, leaves, and underbrush, since they may be ignited by sparks from vehicles, by smoking, or the careless use of matches in adjacent areas. Firebreaks free of flammable material should be provided around each storage site.

f. Items having similar explosion and fire hazards should be stored together.

g. The storage site should be protected to prevent entry of unauthorized persons and tampering with the ammunition. Classified items should be stored separately from unclassified items and appropriately secured.

h. Areas under or within the span of overhead transmission lines should not be used for storage.

i. Water barrels, pails, and hand equipment should be available for fighting incipient fires in storage areas.

j. Storage of components should be in such a manner that periodic inspection and easy removal is possible.

15-9. Groups for Storage

For safety in storage, guided missile components are grouped in three types, based upon the hazards involved: explosive, nonexplosive, and fuel.

15-10. Explosive Components

Explosive components should be stored in a location removed from fuel by a distance of at least 100 meters.

15-11. Fuel (Ethylene Oxide - ET_hO)

Fuel should be stored in a well-ventilated shed. The location should be well-removed from explosive components or nonexplosive components. Fuels must be separated from other combustible material by a minimum distance of at least 50 meters.

15–12. Nonexplosive Components

Nonexplosive items should be stored in dry, well-ventilated locations. Although such items may be stored with explosive components, it is preferable to store these components in a separate location.

15–13. Combination (Mixed) Storage of Explosive Components

Separate storage for each type of explosive component is preferred. For ease in storage, however, combination storage of hazardous components is permitted as shown in table 15–5, provided the net weight of explosive content does not exceed 1,000 pounds.

15–14. Special Handling Instructions for Storage

a. Explosive Components. Special handling instructions for storage of explosive components are given in table 15–6.

b. Fuel (Ethylene Oxide-ET,O).

(1) Ethylene oxide should not be stored at a location where a possibility exists of contaminating water used for drinking purposes or in an area where leaves or other organic material accumulates.

(2) Adequate fire protection, water supply, and access roads should be available.

(3) Buildings should be provided with mast-type lightning protection and must be surrounded by an area extending at least 50 feet in all directions and maintained free of vegetation or combustible material.

(4) Containers of ethylene oxide must always be stored in a vertical position in a well-ventilated area and away from sources of excessive heat. Should containers be stored in the open, provisions must be made to shield them from direct rays of the sun and to prevent the accumulation of dirt, snow, ice, or water on valves and safety devices.

Table 15-5. Combination (Mixed) Storage of Explosive Components

	Explosive harness assembly	Igniter, rocket motor	Rocket motor M5E1 or cluster M42	Rocket motor M300	Safety-and-arming device M30A1	Warhead assembly M135
EXPLOSIVE HARNESS ASSEMBLY	YES.....	L.....	NO	NO	L	L
IGNITER, ROCKET MOTOR	L.....	YES.....	NO*	NO	L	L
ROCKET MOTOR M5E1 OR CLUSTER M42	NO.....	NO*.....	YES	YES	NO	NO
ROCKET MOTOR M30	NO.....	NO.....	YES	YES	NO	NO
SAFETY-AND-ARMING DEVICE 30A1	L.....	L.....	NO	NO	YES	L
WARHEAD ASSEMBLY M135	L.....	L.....	NO	NO	L	YES

*Rocket motors and igniters can be stored together when these items are packaged together.
YES—Indicates permissible storage.
NO —Indicates prohibited storage.
L —Indicates limited storage, not to exceed 1,000 pounds net of explosive.

Table 15-6. Special Handling Instructions for Explosive Components

Component	Special handling Instructions
EXPLOSIVE HARNESS ASSEMBLY	Sensitive to heat, friction, and impact. May be subject to detonation when large quantities are burning. Do not drop, slide tumble, or drag containers over floors or containers.
IGNITER, ROCKET MOTOR	Sensitive to heat, impact, friction, and static charge. Do not drop, slide, tumble, or drag containers over floor or containers.
INITIATOR	Senstive to heat, flame, and rough handling. Handle all packages carefully.
ROCKET MOTOR M5E1* or CLUSTEER M42 or ROCKET MOTOR M30	Handle with care, since propellant grain is fragile and susceptible to damage by rough treatments. Always lift unit by two points with total bearing surface of at least 12 inches. Storage temperature limits for M5E1 and M42, —20° to +130°F; firing temperature limits, —20° to +130° F. M30 storage temperature limits, to +125°F, firing temperature limits, 0° to +125°F.
SAFETY-AND-ARMING DEVICE M30A1	Avoid all rough handling, as devices contain delicate clockwork mechanisms and detonators. Sensitive to heat, friction, and impact. Storage temperature limits, —40° to +140°F.
WARHEAD ASSEBLY M135	Use only approved handling beam for lifting. Keep number of handling personnel to a minimum. Do not drop, slide, or tumble.

*The rocket motors should never be exposed to temperatures below —65° for any period of time.

(5) Use a minimum of wooden dunnage for storage of $ET_h O$.

(6) All electrical equipment, motors, lights, and flashlights used in an area in which this fuel is handled must be vapor-tight or explosion-proof.

Table 15-7. Special Handling Instructions for Nonexplosive Components

Component	Special handling Instructions
STORAGE BATTERY BB 401/U	Store base down on a firm base and within temperature range of —80° to +180°F, charged, discharged, or on continuous (float) charge. Do not allow the caustic liquid to come in contact with the skin. Handle batteries in an upright position.
FINS AND THRUST STRUCTURES	Do not allow the critical fin surfaces or the thrust structure to become damaged or distorted. Handle and store the packages carefully. Do not drop.
MISSILE BODY AND NOSE SECTION	Handle carefully. Do not drop or tumble. All personnel must be indoctrinated in proper handling of missile bodies and nose sections. Store on firm footings, pallets, or dunnage. Containers may be stored two high in outside storage and three high in sheltered storage. The number of containers high should not be more than the number of containers wide.

(7) Adequate water supplies to decontaminate any spills or leaks must be available at all handling sites.

(8) Containers must not be rolled or dropped.

(9) Loading and unloading operations must be conducted in an area which meets the quantity-distance requirements for the amount of fuel being handled. During these operations, the following precautions must be observed:

(*a*) Necessary warning signs must be placed at all approaches and must remain in place until loading is complete.

(*b*) No smoking will be allowed in the vicinity of the loading and unloading operations.

(10) Each shelter in which ethylene oxide is stored must be posted with a fire symbol in accordance with TM9-1300-206. A warning sign (fig. 15-1) will be posted at each shelter storing ethylene oxide. This sign should be 36 inches wide and 41 inches high, with a white background and black lettering. Three 2-inch, colored stripes should be painted at the top of the sign. The stripe at the top edge should be yellow; the middle stripe, blue; and the lowest stripe, grey. Lettering and spacing on the sign should be proportional to the overall size of the sign.

(11) Small fires involving ethylene oxide can be extinguished with carbon dioxide or dry chemical agents if properly applied. Fires involving larger quantities of ethylene oxide are difficult to extinguish, although it is soluble in water. The fire will continue to burn until the liquid is diluted with approximately 22 volumes of water to one of ethylene oxide.

(12) Decontamination is required if leaks or spills occur. The following precautions must be taken immediately:

(*a*) Evacuate all personnel.

(*b*) Remove all possible sources of ignition.

(*c*) Flush away all ethylene oxide with large quantities of water.

(*d*) Immediately remove all articles of clothing, contaminated by ethylene oxide, including shoes, and wash body to remove any ethylene oxide which may have penetrated clothing. Discard or decontaminate clothing; discard shoes.

c. Nonexplosive Components. Special handling instructions for storage of nonexplosive components are given in table 15-7. Since the packages contain delicate electronic components and parts that are manufactured to critical specifications, these instructions must be observed.

15-15. Periodic Inspection in Storage

a. General. Periodic inspection of missiles or components in sheltered or open storage is required. Open storage should be reinspected after periods of heavy rainfall, windstorm, or electrical storm. If paulins or other protective cover have been damaged or unfastened, corrective action should be taken.

b. Ethylene Oxide (ET_hO). Frequent inspections of ET_hO in storage is required. Leaking containers constitute a serious fire and health hazard and therefore should be kept under adequate surveillance.

c. Inspection of Pressurized, Dehydrated Containers. These containers should be checked monthly for change in humidity indicator and depressurization. Depressurize container (refer to chapter 11), and replace spent desiccant bags with activated desiccant when required. Pressurize in accordance with instructions on the container. Make the proper entry on the shipping papers. Check the container for pressure retention after 24 hours, then weekly for 1 month, and monthly thereafter.

d. Inspection. Inspect inert missiles weekly for corrosion or damage from improper handling. Keep the missile clean and dry.

e. Prioity of Removal from Storage. Withdraw missile from storage using the inventory system of first in, first out. Overage materiel should be returned to Ordinance.

15-16. Safeguarding Classified Items and Components

Every effort must be made to safeguard missiles and their components classified for handling, shipping, and storage in accordance with AR 380-55 and AR 55-355.

15-17. Destruction to Prevent Enemy Use

For information on the destruction of material to prevent enemy use, refer to TM 9-1400-250-15/2.

15–18. Shelf or Service Life

a. Ammunition components are marked with the date loaded or the date of manufacture. The dates marked on components are to be used for computing the shelf or service life of the components. Record the dates in the missile record book as required by TM 38–750.

b. If the date of manufacture or loading is not legible, the date should be requested from the Commanding General, Aberdeen Proving Ground, Maryland 21005. The request should include the Federal stock number, nomenclature, and the lot or serial number.

Table 15–8. Established Shelf or Service Life Data

Component	Maximum shelf or service life
Battery BA 472/U series[1]	9 years
Battery BA 485/U[1]	9 years
Battery BA 617/U[1]	8½ years
Rocket motor M30[2]	8½ years[3]
Rocket motor M30A2	10 years
Rocket motor cluster, M42 series	18 years[4]

[1] U. S. Army Electronics Command.
[2] After gas generator 8034201 is replaced by igniter M72, 10602061, this rocket motor becomes rocket motor M30A1.
[3] The shelf or service life of rocket motor M30A1 is extended to 10 years.
[4] Rocket motor cluster M42 is composed of four rocket motors M5E1 or M88. Compute the shelf or service life of the rocket motor cluster M42 by using the earliest load date on any of the component rocket motors.

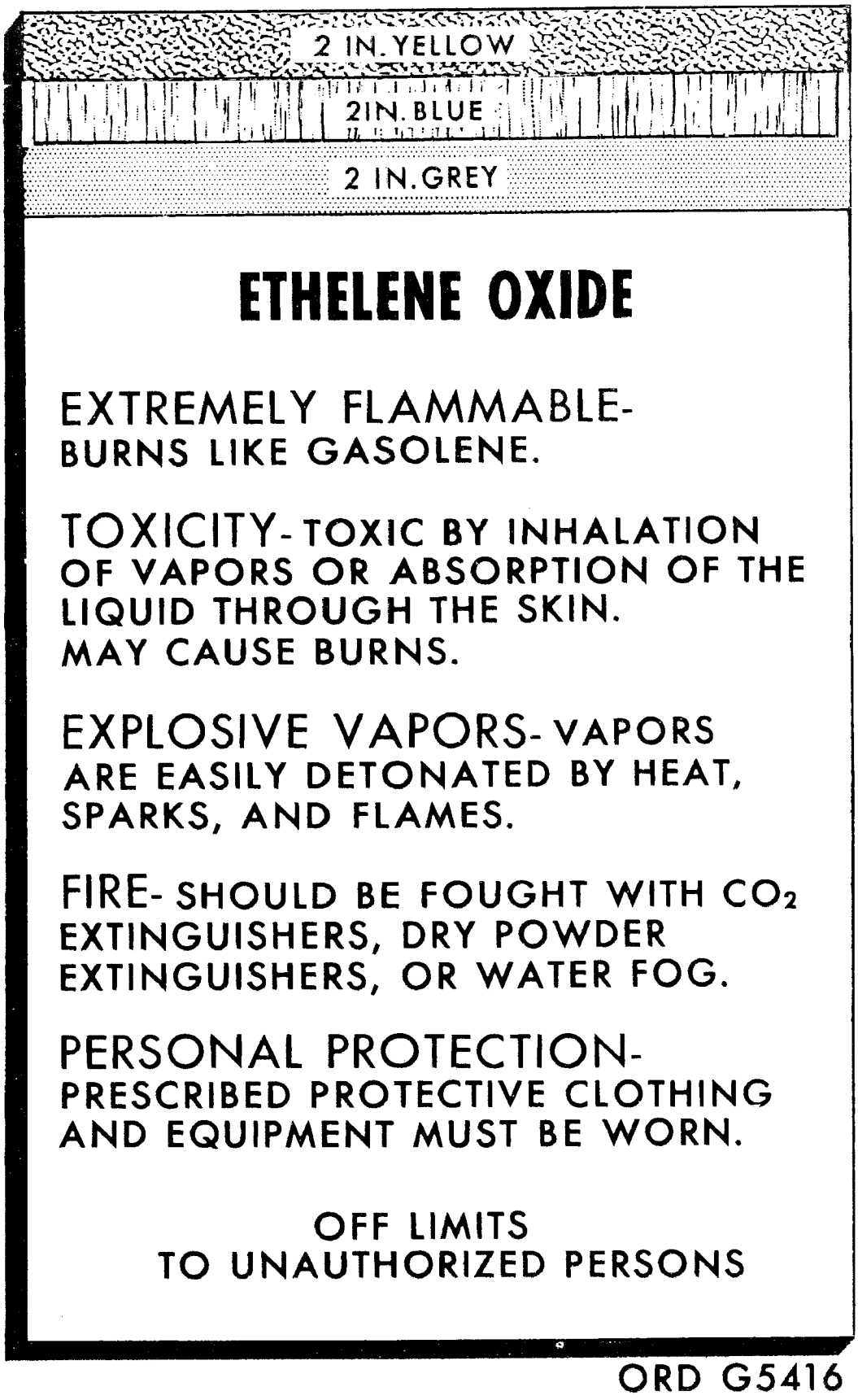

Figure 15-1. Warning sign for ethylene oxide.

Section IV. TORQUE REQUIREMENTS

15-19. General

This section contains instructions for the proper method of using torque wrenches and provides tables of mean torque values applicable to organizational maintenance operations outlined in this manual. It includes information pertinent to the torquing of missile hardware for maximum strength.

15-20. Torque Wrenches

The instructions outlined below must be rigidly observed when using a torque wrench.

a. Clean all lubricant and foreign matter from the threaded surfaces.

b. Do not take torque readings on bolts that have corroded or painted threads.

c. Use a torque wrench of correct size and capacity.

d. While torquing, do not permit the mating member to rotate.

e. Torque by using a continuous rotation of the wrench rather than by short, jerky movements.

f. Take final torque readings while the member being torqued is still rotating.

CAUTION: Always loosen or remove nuts with a standard wrench; do not use a torque wrench.

g. If the maximum allowable torque is applied without rotation, use a standard wrench to back off, and then repeat the torquing operation.

h. When, due to the physical limitations at the point of torquing, an adapter must be used in conjunction with a torque wrench. Reference TM 9-1400-250-15/3 for additional instructions on the use of torque wrenches and computing torque values.

15-21. Torque Values

a. Structural and Functional Applications. Torque data is provided in table form for ready reference by organizational maintenance personnel. Tables 15-9, 15-10, and 15-11 list the bolted connections and torque values for joining the members of the missile body and rocket motor and associated cluster assemblies.

Table 15-9. Missile Body Torque Values

Identifying Number	Description	Mean Torque (pound-inches)
8166916	Handling ring segment captive bolt	100
8162429	Rear main fin attach stud	200
9019830		200
8526034	Rear main fin attach double hexagon nut	500
9025007	Rear main fin retaining hanger-point setscrew	350
8168351	Elevon hinge clevis double hexagon nut	175
	Antenna horn captive screw	15
Z1200-064	V-Band coupling nut	375
AN7-13A	Missile rocket motor mounting bolt	225
9151227	HPU squib battery coupling nut	50
AN4C10A	HPU squib battery mounting bolt	60
8524218	Missile motor section access door	60
9028322	set	60
8524218	Equipment section access cover	60
9031276	plate screw	100
8524218	Actuator section door assembly cover screw	60
9028458	Igniter access cover plate screw	60
AN5-7A	Warhead section mounting bolt	120
8165693	Boltwell cover nut	25
8537536	Boltwell cover screw	25
7601599	Forward fin assembly attach bolt	60
7376018	Forward fin assembly attach bolt	40
593396	Forward fin assembly attach bolt	175
NAS-222-14	Forward fin assembly attach screw	60
MS-21040L5	Forward main fin mounting hexagon nut	95
583749	Forward body section mounting bolt	120
9028421	Retainer screw	15
AN509-10R21	Forward body section boltwell cover screw	25
9019673	Forward body section access door	25
9031169	screw	25
8175531	Sequential timer mounting screw	25
7601593	Forward nose to rear nose attach bolt	60
8521671	Testing fixture captive bolts	120
9977575	Testing fixture hinge captive screw	60
AN509-10R9	Thermal battery assembly mounting screws	25

Table 15-10. Rocket Motor Cluster Torque Values

Part Number	Description	Mean Torque
AN4-4A	Nozzle fairing hexagon-head bolt	40 lb-in.
MS20010-26	Forward retaining rail bar bolt	145 lb-ft.
MS20075-04-05	Elevon lock attach bolt	60 lb-in.
MS20365-428A	Nozzle fairing hexagon nut	60 lb-in.
NAS1310-23	Forward retaining rail bar bolt	145 lb-ft.
180149	Rear retaining rail bar hexagon-head screw	245 lb-in.
503351	Fitting assembly hexagon nut	175 lb-in.
553396	Fitting assembly bolt	175 lb-in.
583751	Forward slipper hexagon-head bolt	175 lb-in.
8161461	Fitting assembly bolt	175 lb-in.
8166270	Fairing wedge hexagon-head bolt	175 lb-in.
8166466	Rocket motor cluster fin assembly hexagon-head bolt	585 lb-in.
8168226	Fitting assembly internal-wrenching bolt	175 lb-in.
8528556	Rocket motor thrust ring assembly internal-wrenching bolt	475 lb-in.
8528557	Rocket motor thrust ring assembly internal-wrenching bolt	475 lb-in.
8528582	Nozzle fairing-fillister-head screw	60 lb-in.

Note. The above values apply only to nonlubricated parts.

Table 15-11. Winterization Kit Torque Values

Part Number	Description	Mean Torque (pound-inches)
7376018	Rocket motor cluster nozzle fairing hexagon-head bolt	40
AN3-4A	Honeycomb fairing hexagon-head bolt	25
MS20365-524A	Threaded-end rod nut	25
MS35298-116	Heater cable shearing clamp hexagon-head bolt	175

Note. The above values apply only to nonlubricated parts.

b. Tubing Applications. Tables 15-12 and 15-13 list the standard sizes of aluminum alloy and steel tubing and specify the required torque values for the tubing coupling nuts.

Note. When the end connections of the tubing are made from aluminum alloy, the tubing coupling nuts, whether made from aluminum alloy or steel, must be torqued to the value listed for aluminum alloy.

c. Tube Fitting Locknut Applications. Table 15-14 lists the standard torque values for locknuts used with gasket-type steel and aluminum alloy tube fittings, unions, and elbows. Refer to the appropriate tubing size in the "Tubing OD" column and read across for locknut size and torque value.

Table 15-12. Torque Values for Coupling Nuts Used With Aluminum Alloy Tubing

Tubing diameter (inches)	Mean torque value[1] (pound-inches)
1/8	12.5
3/16	28.5
1/4	50
5/16	78
3/8	112
7/16	153
1/2	200
9/16	253
5/8	312
3/4	450
7/8	525
1	600
1 1/8	675
1 1/4	750
1 1/2	900
1 3/4	1050
2	1200

[1] Overtorquing of 1/6-turn is permissible.

See footnote at end of table.

Table 15-13. Torque Values for Coupling Nuts Used With Steel Tubing

Tubing diameter (inches)	Mean torque value[1] (pound-inches)
3/16	100
1/4	150
5/16	200
3/8	300
1/2	500
5/8	700
3/4	1000
1	1300
1 1/4	1700
1 1/2	2100
1 3/4	2500
2	2900

[1] Overtorquing of 1/6-turn is permissible.

Table 15-14. Torque Values for Locknuts Used With Gasket-Type Tube Fittings, Unions and Elbows

Tubing OD (inches)	Locknut size across flats (inches)	Mean torque value[1] (pound-inches)	
		Steel	Al Alloy
3/16	5/8	200	78
1/4	1 1/16	300	112
5/16	3/4	300	115
3/8	1 3/16	400	150
1/2	1	700	312
5/8	1 1/8	1,000	450
3/4	1 3/8	1,250	650
1	1 5/8	1,650	1,040
1 1/8	1 7/8	2,550	1,300

See footnote at end of table.

Table 15-14. Torque Values for Locknuts Used With Gasket-Type Tube Fittings, Unions and Elbows—Continued

Tubing OD (inches)	Locknut size across flats (inches)	Mean torque value[1] (pound-inches)	
		Steel	Al alloy
1 1/4	1 15/16	3,550	1,550
1 1/2	2 3/16	4,700	1,950
1 3/4	2 9/16		2,580
2	2 18/16	5,750	3,000

[1] Overtorquing of 1/6-turn is permissible.

APPENDIX A

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

A-1. Scope

This appenidx lists items which accompany the Guided Missile, Intercept-Aerial, MIM-14A, MIM-14B, and Simulator, Guided Missile Flight OA-1643C / M, or are required for installation, operation, or operator's maintenance.

A-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items—Section II. A list of items which accompany the Guided Missile, Intercept-Aerial, MIM-14A, MIM-14B, and Simulator, Guided Missile Flight OA-1643C / M, and are required by the operator / crew for installation, operation, or maintenance.

b. Maintenance and Operating Supplies Not applicable.

A-3. Explanation of Columns.

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column 1.

(1) *Source code.* Not applicable.

(2) *Maintenance code.* Not applicable

(3) *Recoverability code.* Not applicable.

b. Federal Stock Number, Column 2. Not applicable.

c. Description, Column 3. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U / M), Column 4. A 2-character aplphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Authorized, Column 5. This column indicates the total quantity of an item required to be on hand for operation and maintenance of the equipment.

f. Illustration, Column 6. Not Applicable.

A-4. Special Information

Not applicable.

A-5. Abbreviations.

Abbreviation	*Explanation*
AUTH	authorized
NO.	number
REF	reference
SER	serial
SUBQ	subsequent
W /	with

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY AUTHORIZED	(6) ILLUSTRATION (A) FIGURE NUMBER	(6) ILLUSTRATION (B) ITEM NUMBER
		COMPLETE ROUND				
		GUIDED MISSILE, INTERCEPT-AERIAL, MIM-14A AND MIM-14B (NIKE-HERCULES)				
		COMPONENTS OF COMPLETE ROUND				
		THE ITEMS LISTED BELOW ARE THE COMPONENTS OF GUIDED MISSILE, INTERCEPT-AERIAL MIM-14A AND MIM-14B (NIKE-HERCULES), WHICH ARE REQUIRED TO ASSEMBLE A COMPLETE ROUND. THESE COMPONENTS ARE PACKAGED SEPARATELY AND ISSUED INITIALLY AS AMMUNITION ITEMS. REQUISITIONS ARE ISSUED AND GOVERNED BY APPLICABLE TOE, TA OR OTHER DEPARTMENT OF THE ARMY DIRECTIVES. THERE ARE NO ALLOWANCES FOR OVM EQUIPMENT.				
		BODY SECTION, GUIDED MISSILE (SEE GENERAL SUPPLY SECTION FOR REPAIR PARTS)				
		SHIPPING AND STORAGE CONTAINER, GUIDED MISSILE BODY SECTION, M410				
		ACCESSORY POWER SUPPLY (EFFECTIVE SER NO. 10,206 THRU 14,964.) (BASIC ISSUE ONLY.)				
		PUMPING UNIT, HYDRAULIC (EFFECTIVE MISSILE SER NO. 14,965 AND SUBQ.) (BASIC ISSUE ONLY.)				
		MISSILE GUIDANCE SET AN/DPW-17, AN/DPW-17A, OR AN/DPW-17B (EFFECTIVE SER NO. 10,206 THRU 11,970) (SEE TM 9-1410-250-15P/2/1 FOR REPAIR PARTS)				
		MISSILE GUIDANCE SET AN/DPW-18 OR AN/DPW-18A (EFFECTIVE MISSILE SER NO. 13,001 AND SUBQ.) (SEE TM 9-1410-250-15P/2/1 FOR REPAIR PARTS.)				
		CONTROL SURFACES KIT			-	-
		DELAY LINES GA10424 SERIES (FOR AUTHORIZATION SEE TM 9-1410-250-15P/2/1)			-	-
		HORN, WAVEGUIDE GS-18756 SERIES (FOR AUTHORIZATION SEE TM 9-1410-250-15P/2/1)			-	-
		PROPELLANT, ETHYLENE OXIDE (EFFECTIVE MISSILE SER NO. 10,206 THRU 14,964.)			-	-
1		ROCKET MOTOR, M30 W/IGNITER, ROCKET MOTOR, M69 8034201 REF NO. 8034330	EA	-	-	-
2		ROCKET MOTOR, M30A1 W/IGNITER, ROCKET MOTOR, M72 10602061 REF NO. 8031079	EA	-	-	-
3		ROCKET MOTOR M30A2 REF NO. 10228125	EA	-	-	-

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY AUTHORIZED	(6) ILLUSTRATION (A) FIGURE NUMBER	(6) ILLUSTRATION (B) ITEM NUMBER
4		SHIPPING AND STORAGE CONTAINER, ROCKET MOTOR REF NO. 8034264 (AFTER REMOVAL OF MOTOR, RETURN CONTAINER TO DEPOT.)	EA	-	-	-
----		BATTERY TYPE BA485/U (HP UNIT) (EFFECTIVE MISSILE SER NO. 14,965 AND SUBQ.) (BASIC ISSUE ONLY)	EA		-	-
5		BATTERY, STORAGE TYPE BB401/U REF NO. MILS11453 (EFFECTIVE MISSILE SER NO. 10,206-13683.) REPLACEMENT ISSUED ON A DIRECT EXCHANGE BASIS. THREE EACH REQUIRED WHEN A SPECIAL WARHEAD IS USED. SEE SB38-27 FOR LOGISTICAL INFORMATION.)	EA	-	-	-
6		BATTERY, THERMAL TYPE BA-617/U REF NO. 9030655	EA	-	-	-
7		WARHEAD ASSEMBLY, BODY SECTION LESS WARHEAD, M17 OR M17A1 FAIL SAFE KIT, AUXILIARY MODEL 1879-149 REF NO. 9020699 (THIS ITEM IS AUTHORIZED FOR ISSUE AS REQUIRED TO SUPPORT YEARLY TROOP FIRINGS FOR INSTALLATION AND REQUIREMENT REFERENCE TM9-1410-250-34.) SHIPPING AND STORAGE CONTAINER, GUIDED MISSILE WARHEAD, M409			-	-
		ROCKET MOTOR, M42 OR M42A1 IGNITER, ROCKET MOTOR, M24 SERIES, M65 AND M69			-	-
8		FIN ASSEMBLY, ROCKET MOTOR REF NO. 8530458	EA	-	-	-
9		SAFETY AND ARMING DEVICE, GUIDED MISSILE, M30A1 REF NO. 7542841	EA	-	-	-
		(THE ABOVE MAJOR COMPONENTS ARE NOT TO BE REQUISITIONED BY USING UNITS)			-	-
		TOOLS AND EQUIPMENT THE FOLLOWING ITEMS ARE NOT FURNISHED AS COMPONENTS OF THE COMPLETE ROUND. THESE ITEMS ARE TO BE REQUISITIONED IN ACCORDANCE WITH SB9-160				
10		WINTERIZATION KIT, GAS TURBINE GENERATOR SET REF NO. 9019843 (U/O SER NO. 10,206 THRU 11,970.) (SEE GENERAL SUPPLY SECTION OF TM9-1410-250-25P/1/1 FOR REPAIR PARTS.)	EA	-	-	-
11		WINTERIZATION KIT, ROCKET MOTOR REF NO. 9027320	EA	-	-	-

(1) SM & R CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION	(4) UNIT OF MEAS	(5) QUANTITY AUTHORIZED	(6) ILLUSTRATION (A) FIGURE NUMBER	(6) ILLUSTRATION (B) ITEM NUMBER
		REPAIR PARTS FOR MAJOR ITEMS				
		THERE ARE NO ORGANIZATIONAL REPAIR PARTS AUTH FOR 1ST ECHELON MAINTENANCE OF THE COMPONENTS OF GUIDED MISSILE, INTERCEPT-AERIAL, MIM-14A AND MIM-14B				
		EQUIPMENT ISSUED BY OTHER SERVICE ORGANIZATIONS				
		GUIDED MISSILE, INTERCEPT-AERIAL, MIM-14A AND MIM-14B				
		MANUAL, TECHNICAL TM 9-1410-250-12/1		1	-	-
		MAJOR ITEMS				
---- 1	4935-084-2972	SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M REF NO. 9989312	EA	-	-	-
		TOOLS AND EQUIPMENT				
		SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M				
		NONE AUTH				
		REPAIR PARTS FOR MAJOR ITEMS				
		SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M				
		NONE AUTH				
		EQUIPMENT ISSUED BY OTHER SERVICE ORGANIZATIONS				
		SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M (9989312)				
----		MANUAL, TECHNICAL TM 9-1410-250-12/1	EA	1	-	-

FEDERAL STOCK NUMBER CROSS-REFERENCE TO INDEX NUMBER OR ILLUSTRATION FIGURE AND ITEM NUMBER

SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M

FEDERAL STOCK NUMBER	REFERENCE NUMBER	INDEX CODE	FEDERAL STOCK NUMBER	REFERENCE NUMBER	INDEX CODE
4935-084-2972	9989312	1			

REFERENCE NUMBER CROSS-REFERENCE TO INDEX NUMBER OR ILLUSTRATION FIGURE AND ITEM NUMBER

GUIDED MISSILE, INTERCEPT AERIAL, MIM-14A AND MIM-14B

REFERENCE NUMBER	FEDERAL STOCK NUMBER	INDEX CODE	REFERENCE NUMBER	FEDERAL STOCK NUMBER	INDEX CODE
MILS11453		5			
10228125		3			
7542841		9			
8031079		2			
8034264		4			
8034330		1			
8530458		8			
9019843		10			
9020699		7			
9027320		11			
9030655		6			

SIMULATOR, GUIDED MISSILE FLIGHT OA-1643C/M

9989312	4935-084-2972	1